

## **Thorne's Hairstreak (*Callophrys [Mitoura] thornei*) Monitoring**

Second annual report, covering 2010

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### **Abstract:**

This report covers activities performed during our second year of work with Thorne's hairstreak (TH). Activities are summarized with reference to objectives as outlined in our first annual report, and activities for 2011 are projected (field activities for these two central years of the project are very similar). Over the course of 130 field days in 2010, vegetation sampling and butterfly monitoring were carried out as planned. Vegetation was characterized in 249 plots associated with 38 Tecate cypress stands. Butterfly surveys were conducted in 136 plots associated with 33 cypress stands, and juvenile (caterpillar) surveys were conducted in 67 plots in 26 cypress stands. Of those plots surveyed, adult butterflies were seen in 26 plots (18 stands), and caterpillars were found in 5 plots (3 stands). In total, 50 adults were observed and 5 caterpillars were found in the field in 2010. We have also conducted a trial run of habitat modeling analyses, to verify the suitability of our data for the goals of the project. In summary, objectives for 2010 were met, with the primary exception of manipulative experiments for which we were limited by the availability of females in the field, which is unpredictable.

### **Objectives for 2010 (Tasks 2, 3 and 4, see MOU):**

- (1) Conduct occupancy surveys for Thorne's hairstreak (TH) adults and juveniles.
- (2) Characterize habitat associated with TH presence.
- (3) Age trees (by coring) in sampled stands of Tecate cypress.
- (4) Conduct larval and adult experiments to assess the importance of tree age for TH.

### **Objectives for 2011 (Tasks 4, 5, and 6):**

- (1) Continue occupancy surveys for TH.
- (2) Continue vegetation work for previously unsurveyed plots.
- (3) Continue to age trees by coring and counting rings in cores.
- (4) Conduct larval and adult experiments to assess the importance of tree age for TH.
- (5) Analyze data from 2009 and 2010 and prepare final report.

### **Description of completed activities in 2010:**

#### *Vegetation mapping (2010 objective 1)*

Vegetation work was carried out in 2010 as planned in our previous annual report. Specifically, our survey units are 10 meter diameter plots that are randomly located in and around stands of Tecate cypress (stands were located and mapped by us in 2009). Within plots, a number of measurements are taken, including physical characteristics such as slope and aspect,

and biotic characteristic such as the abundance and identity of possible nectar sources and the abundance and density of Tecate cypress (within each plot, vegetation data is taken at 41 points, along 4 transects running out from the center of a plot). In conducting vegetation surveys, the crew (2 people in the field) moved around the mountain by randomly picking a cypress stand each field day, and then a random set of plots within a stand (spreading energy equally among interior, edge and adjacent/exterior plots). As stated in our previous annual report, these vegetation surveys follow the procedures outlined in the San Diego Multiple Species Conservation Plan, though we have modified them to suit the logistical constraints of a 2-person field crew.

Fig. 1 shows the distribution of plots surveyed for vegetation on Otay Mountain (a total of 249 plots associated with 38 Tecate cypress stands); also see Table 1 for a breakdown of effort by stand. Geographical data files associated with the work are being stored at the FWS office in Carlsbad as well as the Forister lab at the University of Nevada, Reno.

The characterization of vegetation on Otay Mountain has been conducted in an effort to address management issues associated with Thorne's hairstreak. In particular, the questions that we will address (pending the collection of data in 2011), include: (1) which stand characteristics (e.g. size, isolation and age of trees) are associated with the greatest probability of TH occupancy? and (2) which characteristics (e.g. nectar availability, open ground) are associated with TH occurrence within stands? Both of these questions have the potential to inform management actions associated with TH habitat. Given the resources that we have, we believe that the 2010 sampling is a solid step towards analyses that will address these questions at the end of 2011 and beginning of 2012 (the completion of our project).

### *TH surveys (2010 objective 2)*

Surveys for TH were conducted both for adults (butterflies) and juveniles (caterpillars). By targeting both of these life history stages, we were able to increase the number of survey days: adults and larvae were observed during the adult flight periods, and larvae only were surveyed other times, primarily in the weeks intervening between the two main broods. By adding larval surveys to our plan, we also gain valuable information because the presence of larvae increases the probability that a given tree and stand supports a population (as opposed to the observation of an adult, which could always be an ephemeral individual moving through).

Adult surveys were conducted by searching within plots for 5 minutes, and noting the activity and position of TH individuals when detected (searching included tapping vegetation with a pole). When possible, the identity of butterflies was confirmed by brief capture in a net. Larval surveys were conducted using "beat sheets" under randomly selected trees within plots (8 total trees per plot).

Adult butterflies were seen in 26 plots (18 stands), and caterpillars were found in 5 plots (3 stands). In total, 50 adults were observed and 5 caterpillars were found in the field in 2010. This data is summarized in Table 1, and also see Fig. 1 for the distribution of plots in which TH were observed on Otay Mountain in 2010.

### *Preliminary analyses*

We have conducted a trial run of analyses with the data collected thus far. By "trial run" I mean that analyses were conducted with the goal of setting up an effective data-handling and

modeling framework. We do not present any detailed results, which would not be appropriate considering the preliminary nature of the work at this point in time, and the fact that any results presented now could easily change with the collection of our second year of data (which will be analyzed in a definitive way during Fall/Winter of 2011/2012).

In brief, our trial run consisted of the following: (1) we created an “environmental” matrix based on the abiotic and biotic variables (not including TH abundance) observed in our plots; (2) this environmental matrix was converted to a triangular distance matrix (in which a single value expresses how similar or dissimilar two plots are based on the observed variables); (3) we used a matrix of TH observations to create a triangular distance matrix for plots based on the abundance and occupancy of TH; (4) we used permuted analyses (appropriate for distance matrices) to address correlations between the environmental matrix, the abundance matrix, and a geographic distance matrix (meters between plots, which allows us to control for spatial autocorrelation). These analyses suggest a weak but nearly significant correlation between the environmental variables and TH abundance. As stated above, the important result now is that we have confirmed that our data can be analyzed with the framework that we have created (finding only a weak correlation between environmental variables and plot-level abundance is not surprising, considering the fact that we have only collected approximately half of the data that we will ultimately have).

### **Challenges in 2010:**

#### *Age trees (2010 objective 3)*

Tree cores were collected as a part of the vegetation survey work in 2010. However, this objective is only partially complete, as we have not been satisfied with the state of preservation of the cores we took. Therefore, we are going to re-core trees in 2011 and use a different method (such as super glue in the field). Counting of tree cores will begin during the 2011 field season and continue in Fall of 2011.

#### *Larval and adult experiments (2010 objective 4)*

Larval and adult experiments were planned, but did not happen due to low numbers of females collected in the field. We need (at a minimum) 5-6 females collected over the span of 1-3 days to get sufficient larvae for experiments. We were simply not able to catch this number of females this year. We are prepared in 2011 to conduct this work pending availability of butterflies.

### **Overview of activities projected in 2011:**

Activities projected in 2011 are very similar to those conducted in 2010, specifically vegetation work, butterfly surveys and experiments if the availability of females is sufficient. The end of 2011 will involve final data entry and the beginning of final analyses which will continue into spring of 2012.

Table 1. Partial summary of survey activities associated with individual Tecate cypress stands. “Total plots mapped” refers to the number of GPS points that have been randomly generated in association with each stand (see Fig. 1). Other columns report the number (and percentage for vegetation) of each of those plots that were surveyed for vegetation and Thornes’ hairstreak (adults and caterpillars) occurrence in 2010.

Stand #	Acres	Total plots mapped	Plots surveyed for vegetation	Percent surveyed for vegetation	Plots surveyed for TH
1	10	18	3	16.67	6
2	1.6	18	0	0.00	0
3	51.4	27	14	51.85	0
5	0.4	6	0	0.00	0
6	8.7	6	6	100.00	4
7	8.7	18	0	0.00	0
8	10.2	21	7	33.33	6
9	16	33	33	100.00	10
10	2.6	9	0	0.00	0
11	2.7	9	1	11.11	0
12	33.2	30	11	36.67	10
13	90.3	48	6	12.50	0
14	3.8	12	8	66.67	5
15	37.5	33	7	21.21	5
16	6.2	15	10	66.67	6
17	0.4	6	0	0.00	0
18	1.7	9	6	66.67	10
19	2.5	9	9	100.00	6
20	0.3	3	1	33.33	0
21	31.2	24	6	25.00	4
22	17.1	18	8	44.44	7
23	19.1	24	5	20.83	1
24	41.2	39	5	12.82	5
25	36.6	36	5	13.89	0
26	16.1	18	3	16.67	7
27	5.1	15	6	40.00	10
28	0.2	3	3	100.00	4
29	0.1	3	2	66.67	3
30	4.6	9	9	100.00	10
31	1.6	9	9	100.00	7
32	1.1	9	6	66.67	2
33	4.6	9	9	100.00	8
34	0 (linear)	4	4	100.00	6
35	1 (linear)	4	4	100.00	6
36	2 (linear)	12	4	33.33	5
37	3 (linear)	4	2	50.00	1
38	4 (linear)	2	1	50.00	1
39	5 (linear)	2	2	100.00	3
40	6 (linear)	2	0	0.00	0
41	7 (linear)	4	0	0.00	0
42	8 (linear)	4	0	0.00	0
43	9 (linear)	4	2	50.00	2
44	10 (linear)	2	0	0.00	0
45	11 (linear)	2	2	100.00	3
46	13.2	18	18	100.00	7
47	1.3	9	9	100.00	10
48	0.2	3	3	100.00	5
	Average:	Total:	Total:	Average:	Total:
	13.76	622	249	51.31	185

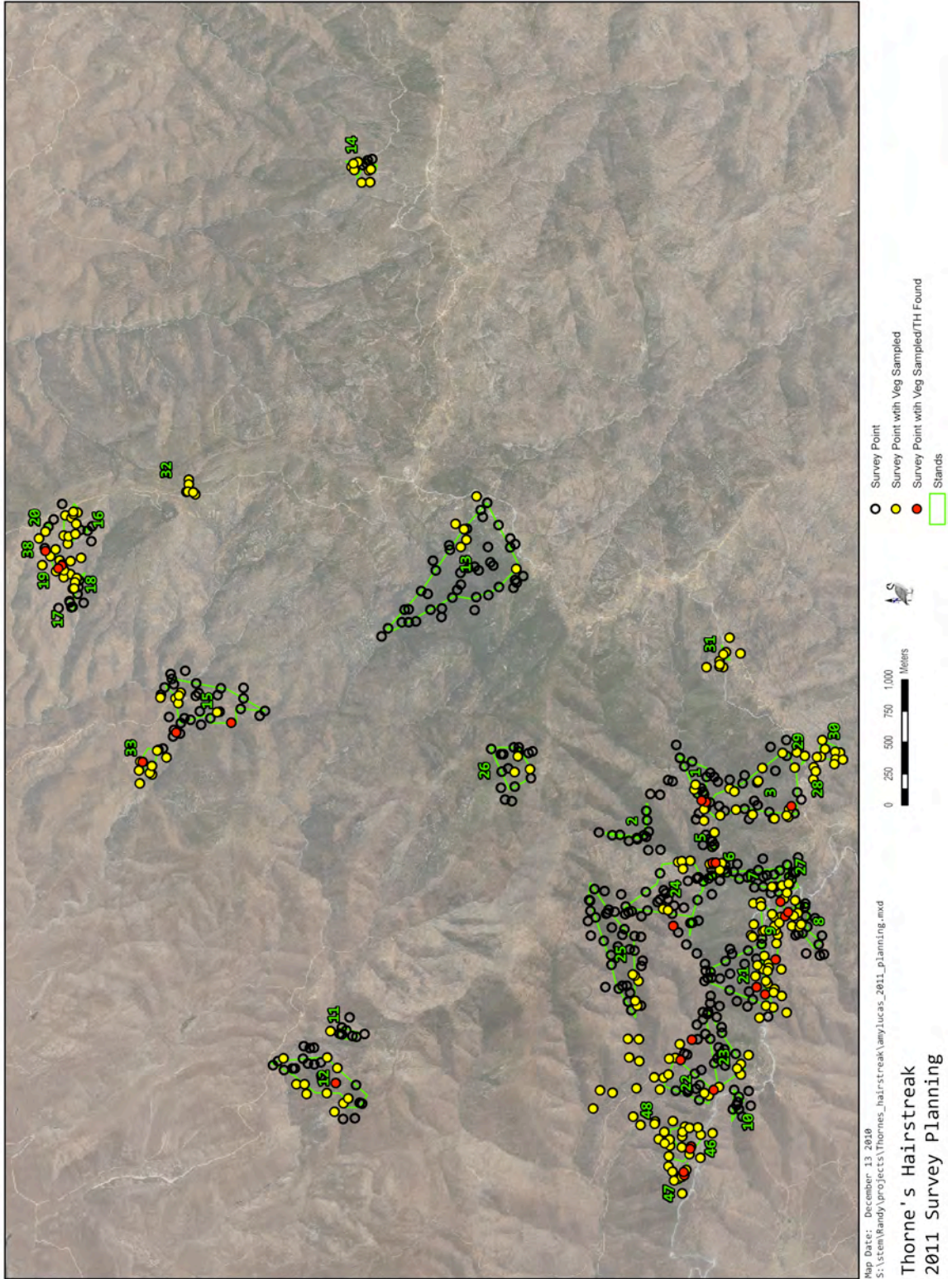


Fig. 1. Map of Tecate cypress stands, vegetation survey activities, and Thorne's hairstreak occurrences as documented in 2010. See legend for symbol associations (note that map should be turned on it's side for proper orientation).